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a. **Transportation in Baltic States**

Whereas considerable information on transport installations in the Baltic States has been collected in recent years, no definitive current estimates of the capacities of railroads and highways of this area are available. The question of capacity, which involves a number of factors in both types of transport, is seldom capable of absolute solution in any event, without careful study of masses of detailed data. The range estimates supplied in this paper, therefore, must be regarded only as rough approximations of the general level at which operational capabilities may under varying conditions be expected to fall.

(1) Railroads

In filling the requirement for capacity of railroad lines, consideration is generally given to the factors which limit operational capabilities, such as single vs double trackage, signalling, methods of train control, yard and terminal trackage, frequency and length of sidings, types of motive power, locomotive repair facilities and a number of less important items. It has not been possible to explore all of the lines and junction points of this area in detail, and hence a general methodology for computation of capabilities was applied. The Soviets have in mind attaining an average daily capacity on main single track lines of over 24 freight trains\* each way, (plus a half dozen passenger trains and auxiliary working equipment), and on main double track lines of 72 similar freight trains each way, plus necessary passenger and work trains. On a schedule of planned priorities, they are working to make possible these and even higher rates of operation.

From a cursory examination of available information on railroad services in the Baltic States, however, it seems highly improbable that, with the exception of two or three main line stretches, such rates of activity are either in effect or contemplated. In an emergency, such as a rapid military build up, with the availability of auxiliary manpower, normal activity could be expanded to the extent that sidings, yard trackage and speed of car loading and unloading would permit.

Enclosed is a copy of the latest CIA Railroad Map on the western portions of the USSR, together with a sketch on which roughly estimated capacities of five foot gauge rail lines in the Baltic States have been entered. Double track stretches are indicated by a double red line. Narrow gauge lines, of which there are a number in the Baltic States, have been omitted from the sketch. Some of the lines have been electrified and others are operated with diesel-electric locomotives rather than steam locomotives. Capacities have been estimated with consideration to the type of power currently in operation.

\*Of about 40 4-axle cars average length.

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The lower figure of the estimate on each rail line represents peacetime daily capacity under present conditions in terms of freight trains of 40 4-axle cars. Because of their greater ease of movement, every two passenger trains moving on these lines have been treated as the equivalent of one freight train. Although the minimum estimate is stated in terms of freight train equivalents, a combined freight and passenger train capability may be obtained by substituting two passenger trains for one freight train. For example on a line having a capacity of 12 freight train equivalents, a combined freight and passenger capability of 15 trains may be obtained by eliminating three freight trains, multiplying these by two, (6), and adding 6 passenger trains to the remaining 9 freight trains for a combined freight and passenger train capability of 15 trains each way per day.

The higher figure has been estimated as 150 percent of the lower figure, plus twice the number of presently scheduled passenger trains. This is the total number of trains which it is believed could be put through each line in each direction daily under conditions approaching an emergency, but a simultaneous capacity operation on all lines would not be possible because of overcrowding at junctions and terminal points.

## (2) Highways

Enclosed is a map overlay showing the primary road network in the Baltic States and some of the road distances between the larger cities. Excepting in a few instances, showing the secondary road network has not been attempted.\*\* There are available no maps of the Baltic States indicating road capacities. Furthermore, recent information covering all of the roads of the area and giving details as to their physical characteristics is absent, making it difficult to derive estimates of road capability except on a general basis.

In arriving at the following estimates, consideration has been given to each of the factors which influence highway capability, and these factors have been applied to data considered typical of the roads in the primary network of the Baltic States as a whole.

All of the roads indicated on the overlay by a double line are believed to be two lane facilities, ranging in total roadway width, (travelway and shoulders), from 6 to 8 meters. The typical surface is gravel, 5 inches in depth. Road sections in the environs of cities and the larger towns are generally wider than 6-8 meters and surfaces as a rule are paved. The roads of the Baltic States cross numerous rivers and streams, and in some places low lying, marshy ground, requiring extensive bridging. It is considered,

\*Roads interconnecting cities and larger settlements.

\*\*Roads joining small towns and villages.

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however, that most bridges found along the roads shown on the map have capacities of at least 25 metric tons and can support all but the heaviest of equipment. In consideration of road alignment characteristics, it is estimated that grades do not exceed 5 percent and minimum horizontal radii are about 150 feet. Vehicle types likely to be used in a supply operation over the roads of the Baltic States would probably range in capacity from 2 to 4.5 metric tons and carry an average payload of 3 metric tons. The predominant subsoil type in the Baltic States is gravel and the soil condition moist. Maintenance is believed to be adequate for normal use. Turning and cross movements which interfere with traffic flow have been given consideration in arriving at the estimates.

Based on these factors, estimates of road capability of two types were made: (1) estimate of capability in "crash" movements where the requirement is to transport maximum tonnages for a short term, and (2) estimate of capability where the requirement is for continuous supply over an extended period.

In crash movements, it is estimated that the capability of roads in the primary road net would average 3,350 vehicles per day in the controlling direction. This capability applies only to one lane, since it is regarded as doubtful that the other lane could be used effectively in the same direction. Such a capability would exist if considerations of surface deterioration and maintenance were disregarded, the number of hours of movement were at the maximum, and no other vehicles were permitted to use the road, except as necessary for control and regulation of traffic. Gravel surfaced roads probably would not remain suitable for crash movements lasting over 5 days, due to deterioration resulting from the application of almost continuous axle loads and the complete lack of maintenance. In winter, during periods of severe cold, surfaces may freeze solidly and roads may retain a high capability for crash movements lasting more than 5 days, but under weather conditions where alternating periods of freezing and thawing are characteristic, durability of roads would probably be less than 5 days.

Where the requirement is for continuous supply over an extended period, capabilities of roads in the Baltic States would average 1,150 vehicles per day in the controlling direction. This estimate gives consideration to the time required for proper maintenance of the roadway.

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A. In 1956 the railroads of Czechoslovakia transported 149 million tons of freight an average distance of 230 kilometers for a total operation ton kilometer performance of 34.3 billion. In tons this represented 60 percent of all freight transported and, in terms of ton kilometers 92 percent. The following table represents all goods transported by all modes of public transportation:

	<u>Rail</u>	<u>Road</u>	<u>Inland Water</u>	<u>Air</u>
Tons	149 million	89.8 million	2,651 million	5,851 tons
TKM	34.3 billion	1.1 billion	1.5 billion	3.6 million

Rail transport in 1957 amounted to 160.5 million tons and about 37.2 billion ton kilometers. It should be borne in mind that freight carried by road transport is predominantly feeder traffic from consignor to rail, inland water, and air carriers and from those carriers to the consignee and is therefore counted again as rail traffic. The average distance of freight carried by rail in 1956 was 230 kilometers and in 1957, 231 kilometers. The average distance carried by road in 1956 was only 12.8 kilometers. There is a concerted effort underway to divert short haul rail traffic, (that moving within a 50-kilometer radius) to road traffic.

The Czechoslovakian railroads operated about 6,000 locomotives and 122,000 freight cars in 1956. Locomotives were predominantly steam but some electric, diesel electric and diesel rail cars are used. The breakdown of freight cars by type is not available. However, about 31,000 of the freight cars are believed to be of the heavy capacity type of which about 4,600 may have a capacity of more than 50 tons.

The weekly trade newspaper, Locomotive, issue dated 22 February 1958, stated that the average turn-around time of freight cars in 1957 was 4.35 days and that average load per freight car was 16.9 tons. Assuming this to be true, 114,400 cars would be required. (365 days ÷ 4.35 days = 83 times per year that one car could be used.) (83 x 16.9 tons per = 1,403 tons per year per car.) (160.5 million tons ÷ 1,403 = 114,400 cars required). Assuming that 7 percent of total freight cars are out of service for repair and maintenance then the total freight car inventory is probably about 122,400 units.

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## II. Locomotive and Freight Car Production

A. The 1957 issue of the statistical yearbook for Czechoslovakia reported the production of 73 main line steam locomotives and 5,896 freight cars in 1956. It is known that some of the production was exported to other Bloc countries as well as to countries of the free world. Main line locomotive production in 1957 was reported to be 156 units of which 106 were steam, 23 electric and 27 other, probably diesel electric or diesel. The same source reported 101 units produced in the first 6 months of 1958 but gave no breakdown of type. Freight car production in 1957 was reported to be 5,459 units, and 2,712 units in the first six months of 1958.

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